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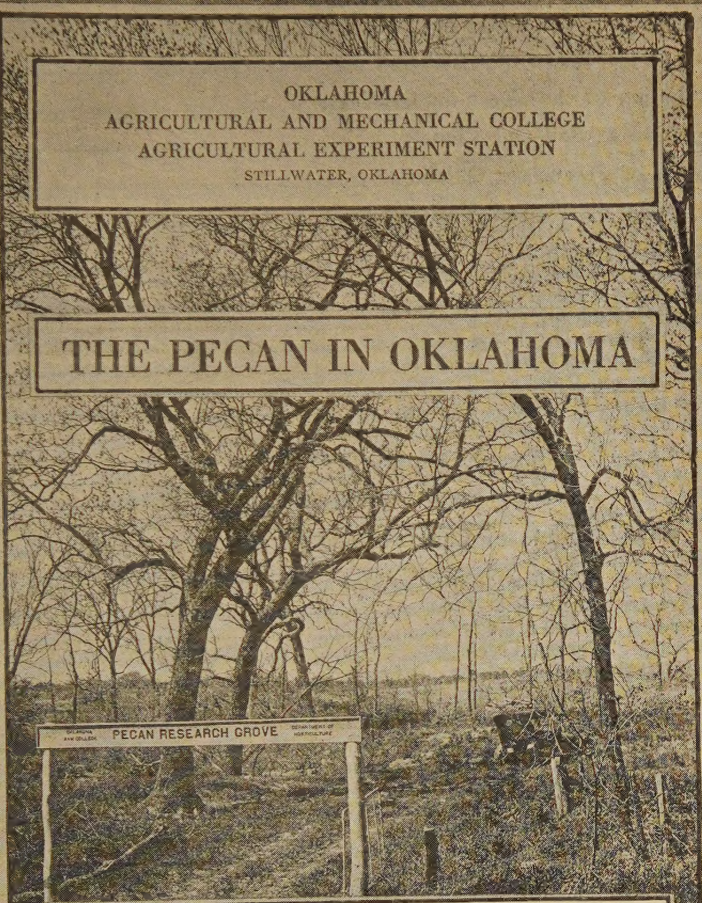
Experiment Station Circular No. 59 April, 1926

OKLAHOMA
AGRICULTURAL AND MECHANICAL COLLEGE
AGRICULTURAL EXPERIMENT STATION
STILLWATER, OKLAHOMA

THE PECAN IN OKLAHOMA



BY D. V. SHUHART

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FOREWORD

The information in this bulletin has been obtained from three main sources. First, the results of experiment stations throughout the pecan belt summarized and fitted to Oklahoma conditions. Second, the experiences of pecan growers in and out of the state of Oklahoma; and third, the results of experiments at the Experiment Station grounds at Stillwater, Oklahoma. The purpose of this bulletin is to bring to the people of Oklahoma the latest and most reliable information at present available on the subject of pecan culture. The industry in our state is as yet too young to permit final information in regard to the pecan and especially to the adaptability of varieties of pecans, but sufficient information is available to permit the weeding out of some undesirable varieties and the selection of dependable ones. Due acknowledgement is made for the use of information obtained from various sources.

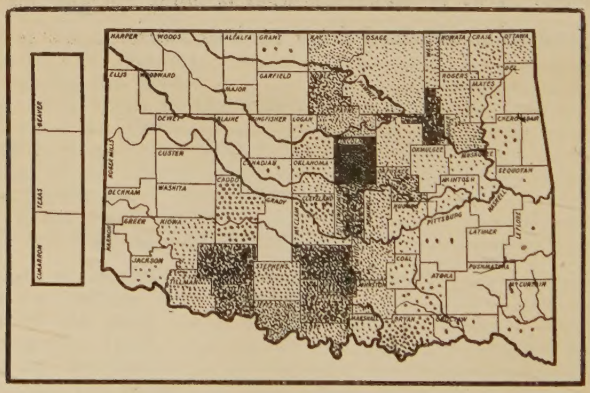
The Pecan In Oklahoma

VALUE OF THE PECAN IN OKLAHOMA

Oklahoma is the second largest pecan producing state in the Union. It is excelled by Texas and is followed by Georgia, both of which states receive a higher price for their product than does Oklahoma. The higher value of the Georgia crop is a direct result of improved varieties in planted orchards. The higher price of the Texas crop is, to some extent, due to improved varieties, but to a greater extent to improved marketing facilities developed through longer participation in the business. The Oklahoma pecan crop for 1919 is given by the Department of Agriculture as 4,296,642 pounds with a value of approximately $1,000,000.00.

The pecan in Oklahoma is as yet a forest product, native trees producing practically all of the crop. The small scattered plantings of improved varieties, although of great importance in an experimental way, do not add much to the production nor to the value of the state's crop as a whole.

Scattered over the state in various places are to be found giant native pecan trees of several feet in diameter. Some of these trees have been estimated to be between five and six hundred years of age. Their origin can only be guessed at, but judging from the vast number of native pecans of a younger age these old trees are the forefathers of our present forests. Their nuts have been spread principally by flood waters and to some extent by crows and animals. Early citizens of Stillwater can remember when only a few pecan trees were to be found along Stillwater creek where today exist many thick groves of trees varying from a few to thirty years of age.



The Pecan Belt of Oklahoma

Fig. 1.—Each dot represents 100 trees. (Data from U. S. Census Compendium).

DISTRIBUTION OF THE PECAN IN OKLAHOMA

The pecan belt of Oklahoma, for the most part, lies at present south and east of a diagonal line drawn from the northeast to the southwest corner of the state. Figure I illustrates the number and distribution of pecan trees in Oklahoma by counties. It will be noticed that the location of trees follows, for the main part, the courses of streams. This is due to their mode of distribution and to their adaptability. The few plantings and top workings of improved varieties that have been made are limited in their distribution. Oklahoma has as yet hardly started to develop this native resource.

ADAPTATION TO SOIL AND CLIMATE

We have brought the apple, the peach, and other fruits from the Old World and by selection have secured fruits adapted to our conditions. The Persian walnut has been adapted to certain parts of the United States, while the pecan, a native product of Oklahoma, has in the past been given little attention.

The pecan will succeed in a variety of soils but in most all instances the soil must be deep. Much moisture is required by this tree but it will not thrive in a water logged soil. A deep well drained soil is an ideal soil for the pecan. Bottom lands are usually of this type even though they may overflow occasionally. Overflow land on which water does not stand for long periods of time is often ideal pecan land. The overflows serve as irrigation to the trees and it is only an occasional happening that an overflow would interfere with the harvesting of the crop.

Low rough lands lining creeks may be reclaimed by planting to pecans. In the more humid sections of the state the pecan will succeed practically as well on deep upland soil (within the bounds of reason) as it will on bottom land. Cotton is often taken as an indicator for the pecan, it being a tentative rule that the pecan will succeed where cotton grows well.

VARIETIES OF PECANS FOR OKLAHOMA

The more desirable varieties of pecans require a long growing season. For that reason the northern part of the state must depend upon one of three sources for their improved pecan. They may use the earliest of the most desirable named varieties, they may use the more northern hardy varieties, or they may depend upon local seedlings of a fairly desirable nature which are yet unnamed as varieties. However, it has recently been found that some varieties which require from 270 to 290 days to mature their nuts on the Gulf coast will mature in from 190 to 200 days at the Experiment Station at Stillwater.

The climate of the south and southeastern parts of the state is favorable to the use of many important named varieties including those varieties of Oklahoma origin. The Oklahoma Pecan Growers' Association is at present recommending the Stuart, Money Maker, Burkett, Oklahoma and Williamson.2

The question of varieties has not as yet been definitely settled for Oklahoma. Some varieties which are well established in older pecan sections are just beginning to come into bearing in this state. A long list of varieties is undesirable but a commercial planting should be made up of the most dependable and prolific varieties obtainable. Judging from results at the Experiment Station at Stillwater and from trials in other places, the Money Maker is the most desirable variety for the northern half of the pecan belt of Oklahoma. For the eastern part of the southern half of this belt the Money Maker, Schley and Stuart may be used. For the western part of the

southern half of the belt the Halbert, Burkett and Texas Prolific will give best results.

This does not mean that these varieties are the only ones which are adapted to these divisions of the pecan belt of Oklahoma, nor does it mean that these varieties will not be successful if used in parts of the belt other than that for which they have been recommended, but it does mean that, so far as our present information permits us to judge, these bounds should be used. Local conditions of soil, moisture, and exposure are of greater importance that the close selection of a variety.

DESCRIPTION OF TYPICAL VARIETIES

Southern Varieties

Money Maker.—This variety is known to be a consistent and early bearer in many pecan regions. It is gaining in popularity among some of the largest growers. In Oklahoma the nut is medium in size (about 65 to the pound), ovate approaching spherical in shape, is greyish brown in color and is marked at the apex end with conspicuous splashes of black. The shell is of medium thickness; the kernel is dark straw colored, is large, plump, round, firm, and is of fair quality. The ratio of kernel to shell is approximately 48 per cent. The cracking quality is very good but the shape of the nut is not satisfactory for machine cracking.

The chief assets of this variety are its wide adaptability, its earliness and its prolific bearing.

Pabst.—This variety originated in Mississippi. It has been grown in many parts of the pecan belt of the United States. In Oklahoma the nut is large, oblong and cylindrical, the central diameter being carried well out to the base and apical ends. The shell is of medium thickness, the color is brown with conspicuous broad splashes of black; the kernel is light brown in color, plump and of very good quality. The ratio of kernel to shell is approximately 47 per cent. The cracking quality is very good.

The Pabst is just starting into bearing at Stillwater. The variety cannot be recommended as yet for commercial plantings but it is worthy of further testing.

Schley.—This variety originated in Mississippi and has been widely planted. It is recognized as a standard of excellence. In Oklahoma the nut is medium to above medium in size, oblong, obovate, bluntly pointed at base and sharply pointed at apex, irregularly ridged, greyish brown in color, and is marked with slender splashes of purplish black and numerous black specks. The shell very thin; the kernel is large, smooth, light straw colored, and excellent in quality. The ratio of kernel to shell is approximately 55 per cent. The cracking quality is excellent.

The Schley has been in bearing for three years at Stillwater and in some other sections of the state. It is promising to be worthy of a place in Oklahoma plantings.

Stuart.—This variety originated in Mississippi and is probably the most widely known of all pecans. It has often been recommended for planting in new regions because it is known to do well under a great diversity of conditions. In Oklahoma the nut is above medium, oblong, cylindrical, light brown in color and is marked with conspicuous black splashes which carry back well past the center. The shell is of medium thickness, the kernel is large, plump, straw colored, well filled and of very good quality. The ratio of kernel to shell is approximately 48 per cent but the cracking quality is only fair, due to the fact that the kernel is easily broken with the shell be-

2. Bulletin No. 1, Oklahoma Pecan Growers' Association.

cause of its being too well filled. This variety is just coming into bearing at the Experiment Station at Stillwater.

Success.—This variety is not as yet in bearing at the Experiment Station at Stillwater. It is an excellent variety in other states and is considered as a good possibility for the southern half of the pecan belt in Oklahoma. The nut is large, egg shaped, thin shelled, plump kernel of good quality and it has an excellent cracking quality. The ratio of kernel to shell is approximately 50 per cent.

Northern Varieties

Indiana.—The Indiana is the only representative of the northern varieties which is in bearing on the Experiment Station at Stillwater.

This variety originated in southern Indiana. In Oklahoma the nut is medium sized; oblong, flattened, longitudinally ridged on the sides, greyish brown in color, and is practically devoid of markings. The shell is of medium thickness, the kernel is brittle, irregular in outline, light straw colored, rich, and of fair quality. The cracking quality is good.

This variety is early to mature but is not superior to many of the native Oklahoma nuts. It may be planted as specimen trees in the northern part of the state.

Eastern Varieties

Mantura.—This variety originated in Virginia. It is not widely disseminated. In Oklahoma the nut is large in size, cylindrical, pointed at the apex and blunt pointed at base. Its color is greyish brown. It is marked with abundant splashes of black and is thickly specked especially at the base end. The shell is thin; the kernel is plump and well filled in some years but in others it is shriveled at the base. The color of the kernel approaches an olive drab, and its quality is good. The ratio of kernel to shell is approximately 45 per cent. The cracking quality is good.

This variety is desirable for specimen plantings in the northern parts of the pecan belt of Oklahoma.

Western Varieties

Burkett.—This variety originated in West Central Texas. It is especially well suited to the semi arid parts of that state where soil conditions are favorable. The nut is large, oval approaching spherical, thin shelled, kernel plump and of excellent flavor. The ratio of kernel to shell is approximately 55 per cent. The cracking quality is good but its shape is not desirable for machine cracking.

This variety is not in bearing at Stillwater.

Halbert.—The Halbert is another Texas variety which has been widely used in both planted groves and in top worked native groves. In Oklahoma the nut is medium or below in size, oval approaching spherical in shape, and has two prominent enlargements on the apex end. Its color is light brown and it is marked with conspicuous splashes and lines of a purplish black, which sometimes approaches red in color. The shell is very thin; the kernel is straw colored, plump, round, and of excellent quality. The ratio of kernel to shell is approximately 60 per cent. The cracking quality is excellent but the shape of the nut is not satisfactory for machine cracking.

This variety is in bearing on several top worked trees at the Experiment Station and it has been reported to be successful on top worked trees at other places lying in the western parts of the pecan belt of Oklahoma. It is usually a very prolific variety.

San Saba.—The San Saba originated in San Saba county, Texas. In Oklahoma the nut is small, oval, brown in color with purplish black splashes. The shell is very thin; the kernel is plump, well filled, straw colored and of excellent quality. The ratio of kernel to shell is approximately 60 per cent. The nut is not suited to machine cracking nor is it valuable as a commercial nut but for home use it is very desirable.

Sovereign (Syn. Texas Prolific).—This variety originated in west central Texas. The tree is a prolific bearer and often begins bearing at a comparative early age. The nut is above medium in size, is oval in shape, light brown in color, and is marked with black splashes and lines from the apex. The cracking quality is poor but the kernel is plump and well flavored. The ratio of kernel to shell is approximately 55 per cent.

This variety is in bearing in the state and is worthy of further trial.

PECAN PROPAGATION

Planting Seed

A large pecan nut will only occasionally reproduce itself. It is a variety mixture of many generations of nuts of various sizes. The planting of seed is done to secure nursery stock or to secure seedling plants which are to be budded to a known variety.

The size of the nut does not have any effect upon the kind of roots it produces. Small nuts often produce trees which are more desirable for stock than those produced by large seed. For planting purposes small pecan nuts are more desirable than large ones. They cost less, there are more nuts per pound, and they produce as good if not better stock than the large varieties.

Pecan seed may be planted as soon as the nuts are harvested. If the moisture conditions are favorable a good stand may be secured in this manner. The moisture may be retained by mulching the nursery row or planted areas with straw.

Where moisture conditions over winter are not satisfactory pecan seed should be stratified in sand by placing a layer of nuts and a layer of sand in a box or pit, where they may be kept moist by watering. When the pecans have begun to swell or crack open in the spring they should be planted from 12 to 18 inches apart in rows from 42 to 48 inches apart if a nursery is to be started, or from ten to twenty nuts may be planted at each place where trees are desired. The large number of seed permits the selection of a fast growing vigorous stock which would not be possible if only a few seed were planted.

The seedling pecan is slow in growth above ground for the first two years. The first year it usually grows from five to eight inches above ground and from twelve to twenty-four inches below ground. It usually requires three years for seedlings to be large enough to bud.

Budding Pecans

Many methods of pecan budding have been tried. Each operator usually has some slight change in the general methods which to him seem to give best results. The best general methods are described here. The two types of budding in common use in the older pecan regions are the patch bud for the growing season and the chip bud for the dormant season.

Patch Budding

The patch bud is a growing season bud. It can only be used when the bark is slipping on both the stock and the bud wood. The two principal

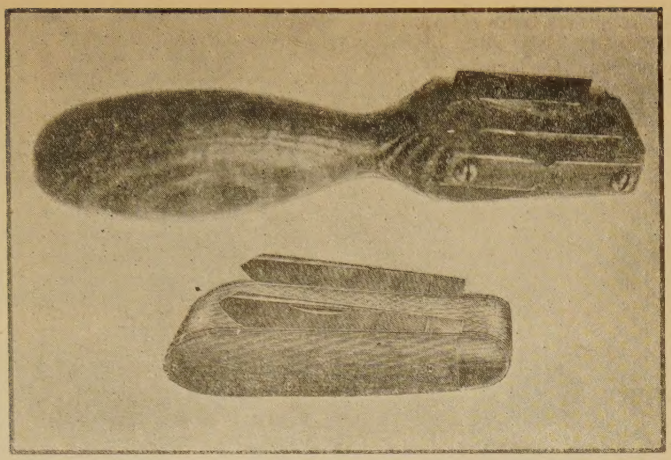


Fig. 2. Modern Patch Budding Knives.

times for patch budding during the growing season are in spring and in late summer.

Spring budding requires buds of previous season's growth. The bud wood should be cut while dormant, tied in bundles, properly labeled, wrapped in moss, or clean shavings, and kept in cold storage at a temperature close to 32° F. The extensive use of ice even in very small towns makes this recommendation practicable. A refrigerator in a butcher shop or an ice house is an excellent place for such storage.

The bark on cold storage dormant buds does not slip when first taken from storage. A few days before the bud wood is to be used it should be taken out of storage and permitted to warm up to the temperature of air. This will cause the bark to slip. The buds must at no time be allowed to dry out. To avoid drying the moss or shavings surrounding the buds should be kept moist.

Summer Patch Budding

Summer budding permits the use of bud wood of the current season's growth. By the latter part of July or first of August in Oklahoma the current season growth is mature enough to be used for bud wood. The buds are found in the axles of the leaves. The leaves may be pulled from the bud wood a few days before the wood is cut from the tree to permit the wounds thus made to heal without drying out the buds. A larger quantity of bud wood should not be stripped of leaves unless it is to be used within a week, because the buds may be forced into growth by this treatment. Another method of handling bud wood is to cut the leaf stem off about an inch from the bud stick. This stem may be cut off as the buds are used.

Patch Budding Tools

Patch budding requires a double bladed knife. Figure 2 illustrates some good types of double bladed knives. Some types of patch budding tools require a single bladed knife, while others are designed to do away with the second knife. It has been found, however, that the use of two knives, one double bladed and one single bladed, make the best combination of tools

because the single bladed knife is a more convenient tool to use in shifting the bud from the bud stick to the stock. A good sharp pocket knife will do for the single bladed knife.

Waxed Cloth

Waxed cloth is an inexpensive material which has been used for many years for covering pecan buds. It may be prepared as follows: Dip some old sheeting in melted bees wax, tear the cloth in strips one and one-half inches wide, and fold into a pack two inches long. A hole should be punched in the center of the pack. Each fold may be torn off separately and used to cover the bud. The bud must then be tied over the cloth cover. Ordinary cotton twine string cut in about 18 inch lengths is the most convenient material to use for this purpose. The details of tying are shown in Operation No. 9 of Fig. 4.

Paraffin Paper

This paper may be cut in rectangles one and one-half inches by two inches. A hole is then punched in the center. A heavy quality of paraffin paper will give best results. These covers may be placed over the buds and tied down with string as described for waxed cloth.

Liquid Wax

This material is in extensive use in pecan budding in Texas. The bud is first tied with string and then a coat of wax is applied over the patch. Meltted paraffin is sometimes used instead of the wax. The wax may be prepared as follows:

Beeswax, 1 pound
Resin, 2 pounds
Alcohol, (pure grain), ½ pt. or enough to soften

Linseed oil may be used to replace the alcohol. The resin and beeswax should be melted together and then cooled before adding the alcohal. The wax should have about the same degree of softness as that of cup grease. It may be applied to the bud with a small paddle, brush, or end of the finger.

"Z O" Patch Budding

The use of zinc oxide adhesive plaster for patch budding has been thoroughly tested by the Oklahoma Experiment Station. It is the most convenient material so far used for this work. Its expensiveness is offset by the increased number of buds which may be set in a day by this method. The plaster may be prepared as follows: A ten-yard roll of one and one-half inch zinc oxide adhesive tape is rolled out and securely fastened at each end to prevent its touching any object to which it might stick. Holes are punched every two inches with a sharp leather punch. With scissors or a sharp knife a cut about one quarter inch deep is made on one end of the tape half way between the holes. The tape is then rolled up and is ready for use.

The Technic of Patch Budding

Speed is one of the most important factors in successful pecan budding. It can only be developed by practice with attention to a systematic technic. The following technic has been thoroughly tested and is designed to eliminate all unnecessary movements. The technic will differ slightly with the kind of material used to cover the bud. The technic here given is for the " Z O" patch budding. An extra operation is required for tying the bud where

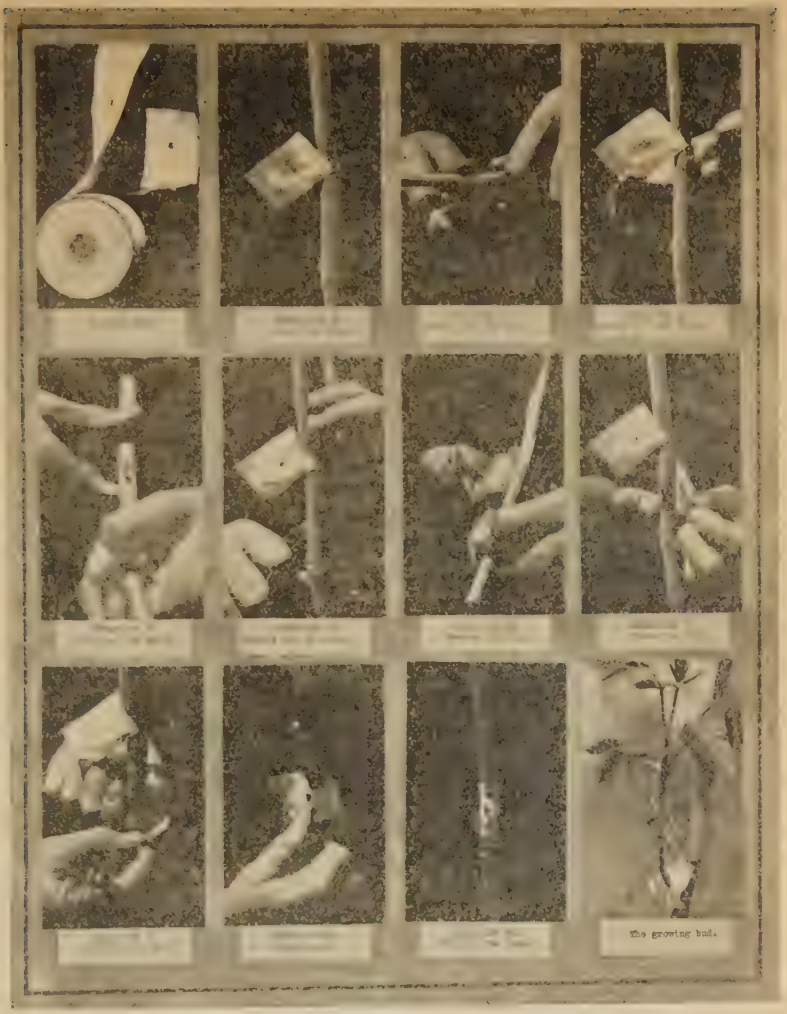


Fig. 3. The Technic of Patch Budding.

other covering materials are used. The technic of patch budding is illustrated in Fig. 3.

Operation No. 1. Tear off an adhesive tape bud cover and stick one corner of it in a convenient position on the stock.

Operation No. 2. Make a cut on the stock with the double bladed knife.

Operation No. 3. Make a cut on the bud wood centering the bud between the blades of the double bladed knife then drop the knife in the budder's kit and pick up the single bladed budding knife.

Operation No. 4. Make the longitudinal cuts on the sides of the bud with the single bladed knife and loosen but do not remove the bud.

Operation No. 5. Make one longitudinal cut on the stock and loosen the bark.

Operation No. 6. Remove the bud by inserting the end of the single bladed knife under it, and placing the tip of the thumb on the top of the bud and over the tip of the knife blade. This is the principal reason for using two knives instead of one combination knife. A firm grasp of the bud is possible in this manner.

Fig. 4. The Technic of Chip Budding.

Operation No. 7. Lift up the bark on the stock to admit the bud patch.

Operation No. 8. Clip off the bark the correct size to fit snugly against the patch.

Operation No. 9. Apply the zinc oxide adhesive tape over the bud.

Operation No. 10. Stick the tape down by stretching in each direction.

Chip Budding

Chip budding is a dormant season method which is performed from bout the first of March until the bark is slipping well enough for patch udding. A successful chip bud when forced out in early spring will give as uch growth in the same season as a patch bud which was set in the revious summer. Its most objectionable feature is that it is difficult to btain a high percent of successful buds with the method. A good budder oes not usually obtain more than fifty percent of successful buds. If buds are plentiful this method can be used advantageously to advance the budding period for a month or more in the spring.

Bud wood for chip budding is best taken directly from the dormant tree for immediate use. Dormant cold storage bud wood, however, will give good results.

The Technic of Chip Budding

Operation No. 1. With a large barn door staple make a mark on the bud centering the bud between the points.

Operation No. 2. Make a mark on the stock where the bud is wanted with the staple.

Operation No. 3. Start at the mark above the bud and make a long sloping cut running under the bud but do not cut the bud loose.

Operation No. 4. Hold the bud down tight with the left thumb.

Operation No. 5. Make a 45° cut at the bottom staple mark on the stock.

Operation No. 6. Make the long sloping cut from the top staple mark and remove the chip.

Operation No. 7. Make the 45° cut at the bottom staple mark on the bud.

Operation No. 8. Insert the tip of the knife under the bud, place the tip of the right thumb over the bud and carry it to the matrix.

Operation No. 9. Place a "Z O" plaster over the bud and press down with the thumbs below and above the bud. (Any other cover may be used or the bud may be tied with string for this operation.)

Operation No. 10. Stretch and stick the "Z O" plaster first around one side and then around the other. (If waxed cloth or paper has been used the bud should be tied. If the bud has been tied without a cover it should be waxed for this operation).

Fig. 4 illustrates the technic of chip budding.

Bark Grafting

The use of the bark graft for top working pecan trees is coming into prominence in some parts of the pecan belt. It is a growing season method which uses dormant cold storage scions. The trees may be cut back and grafted as soon as the bark slips in the spring. It is important that the grafting be done immediately after cutting back and that the end of the stub be coated with grafting wax or hot paraffin.

The Technic of Bark Grafting

Operation No. 1. Slice off a chip of bark for about two inches from the end of the stub in such a manner as to leave it about one sixteenth of an inch thick.

Operation No. 2. Slit the bark in the center of the place just prepared.

Operation No. 3. Loosen the bark slightly at the top of the slit.

Fig. 5. The Technic of Bark Grafting.

Operation No. 4. Prepare the scion by making a diagonal cut, at the bottom end, from one and one-half to two and one-half inches in length.

Operation No. 5. Insert the scion under the bark of the stock.

Operation No. 6. Immediately cover the wounds with a soft wax to shut out the air.

Operation No. 7. Stick two match sticks in the wax on each side of the scion.

Operation No. 8. Tie the scion in place and adjust the match sticks so that the pressure of the string will keep the bark firmly against the scion.

If a tree is cut off below the surface of the soil a bark graft may be inserted and the soil pulled in around it to keep it moist until growth starts.

The technic of bark grafting is shown in Fig. 5.

Care of Spring Set Buds

The chip bud makes a rapid growth before the new cells have had time to harden. It is therefore easily blown out by wind if close attention is not given it in the matter of tying up the bud. To cause the buds to force out all of the native buds should be removed from the stock. If string has been used to tie the bud it should be cut with a sharp knife on the side of the stock opposite the bud, just as soon as the bud starts to grow. No attempts should be made to remove the string for there is danger of rupturing the tender cells which have united the bud to the stock. As soon as the new growth is about six inches in length it should be tied to the stub of the stock with strips of cloth as is illustrated in Figure 4.

Care of Summer Buds

The summer buds should be put in place without the removal of much of the foliage of the sprout. It will therefore be kept dormant over winter. The string used to tie the buds should be cut about three weeks or a month after the bud is set. The following spring the bud needs the same attention in regard to forcing and tying up as the spring set buds.

The portion of the stock above the bud should not be removed until the winter after the bud has been forced out. The wound so made should be covered with paraffin, white lead, asbestos roofing cement, or liquid elastigum.

Planting Pecan Trees

Many losses have resulted in Oklahoma from improper methods of handling pecan trees. The first cost of pecan trees is necessarily high but the cost per tree is greatly increased if a number of them fail to grow. Pecan trees can be successfully transplanted in Oklahoma if proper precautions are observed.

The successful planting of pecan trees starts at the nursery row, or wherever the tree is first dug. As each tree is dug its roots should be covered with soil to keep them from drying out while other trees are being dug. A good way to do this is to heel the first tree in with the soil that is dug from the second. When as many trees as are needed have been dug the trees should be pulled out and their roots dipped in mud. At no time should pecan roots be exposed to drying winds or to the direct rays of the sun.

Pecan trees which are to be shipped should be wrapped in wet hay or shingle tow and covered with burlap. When the trees are received from a nursery they should be planted at once. If immediate planting is not possible they should be healed in and watered in a protected place until they can be planted. All holes should be ready to receive the trees before the trees are taken to the field.

System of Planting

The square system is the most desirable for a pecan orchard. The trees should not be set closer than fifty feet in each direction. On good strong bottom land 66 feet is the most desirable distance. The number of trees required to set an acre is shown in the following table:

Number of trees per acre (square system)

50 ft. x 50 ft., 17 trees.
55 ft. x 55 ft., 14 trees.
60 ft. x 60 ft., 12 trees.
66 ft. x 66 ft., 10 trees.
74 ft. x 74 ft., 8 trees

A planting board should be used to permit the accurate location of the tree. 3

Digging the Holes

A hole for a pecan tree should be deep enough to accomodate all the tap root. This often requires a hole three feet deep. A good practice is to dig

3. See your county agent for instructions.

the hole eighteen inches wide by three or four feet long at the top. This permits a deep hole to be dug with less effort than is required to dig a round hole to the same depth.

Hauling Trees to the Field

After the holes are dug the trees may be taken to the field, but at no time should their roots be exposed. If they have just been received they

Fig. 6. Protecting the Tree from Bruises
(From N. C. Dept. of Agri. Bulletin)

may be taken from the shipping bundle and placed in a barrel half full of water and carried to the field. If the trees have been heeled out they may be laid in the wagon bed and covered with wet hay. The trees should remain covered at all times until planted. A wet sack should be kept around the roots of the trees while they are being carried to the holes. The trees should not be distributed to all of the holes before setting begins. Each tree should be set as soon as it is placed in the hole.

Setting the Trees

Broken roots should be pruned off. The tree may be correctly placed by means of a planting board. One person should be in the hole to arrange the roots and to firm the soil about them. Top soil should be used to fill the hole. When the hole is half full of soil one or two buckets of water should be added. After the water is added the remainder of the soil should not be firmed but the roots should be arranged in their natural position as the hole is filled.

Protecting the Tree

The newly set pecan trees need protection from rabbits, protection from drying, and protection from cultivation implements. Rabbits are very fond of the bark of a young pecan tree. Several unprotected trees can be girdled over night. To prevent this a guard of screen wire should be placed about the tree or it may be wrapped with a gunny sack or newspaper. If the stems of the pecan trees dry out before the roots get established they are apt to die back below the bud. This may be avoided by mounding the soil around the newly set tree for a height of about two feet. This mound should be removed in the spring when growth starts. When the young pecan trees start into growth it can be badly damaged by cultivation implements. The bark slips readily and its nature is such that a very large wound may be made by a seemingly small scratch. These wounds set back the trees and sometimes permit borers to enter. To avoid this three strong stakes should be driven around the young tree. See Fig. 6.

Pruning Pecan Trees

Young trees should be pruned to a single whip with the idea of developing a full leader tree. An ideal form for a pecan tree is a central stem or leader with twelve scaffold branches spiraled around the tree at approximately two foot intervals. This form is in keeping with the natural development of the pecan, gives the maximum of bearing surface and yet is within the reach of modern spraying machinery. With this ideal in mind an effort should be made to train the young tree so that it will conform to the ideal as nearly as possible. The time to correct the growth of a tree is before that growth has started. Undesirable buds or shoots can easily be rubbed off and the energy of the tree may be thus turned into the branches or buds which are desired. It is a serious mistake to neglect the timely pruning of a young tree. Fig. 7 illustrates a well formed pecan tree.

Intercropping the Pecan Orchard

The great distance between pecan trees makes it possible to cultivate row crops for five to seven years without any appreciable reduction of yields. A row should be skipped where the pecan row stands. This practice is desirable since it permits the use of the land and provides an easy means of cultivation for the young trees. In some sections of the pecan belt many of the large bottom land cotton farms are being gradually converted into pecan orchards in this manner. If the soil permits some fruit trees may be

used as fillers for the pecan orchard. Peaches have been used quite extensively for this purpose on suitable soils.

Care of the Pecan Orcherd

For the first three or four years the pecan is a slow growing, rather tender tree. After that time it is usually a vigorous fast growing tree. During the time that the newly set tree is getting established it should have the best of care. If the soil has been mounded up, screen wire has been placed, and three stakes have been driven in a triangular form about the tree it has had excellent care for the winter. In the spring the mound should be leveled and the undesirable buds should be rubbed off. During the summer good cultivation should be maintained and the training of the tree resumed until

Fig. 7. A Well Formed Pecan Tree.

growth has stopped, which is usually about the first of July for average Oklahoma conditions. During the winter a cover crop of rye may be grown to advantage, provided it is turned under early enough in the spring. For the bearing pecan grove clean cultivation is the ideal form of culture during the growing season.

Yields and Bearing Age of Pecan Groves

No information is as yet available concerning the yields of pecan orchards in Oklahoma. The following table has been taken from the U. S. D. A. records of a ten-acre pecan orchard at Thomasville, Georgia. The records were started when the trees were five years old. The bearing age of the pecan is shown very clearly:

Official Records for Ten Years of a Ten-Acre Pecan Orchard 4

(U. S. D. A., 1910-20)

Age	Production	Average Per Tree	Value at 40c
5	210	1.16	84.00
6	1107.14	6.15	442.86
6	1107.14	6.15	422.86
7	603.11	3.35	251.24
8	2412.07	13.40	964.83
9	433.15	2.41	173.26
10	321.88	1.78	128.75
11	2359.65	13.10	943.84
12	7840.65	43.56	3136.26
13	1456.45	8.09	582.58
14	5611.00	31.17	2244.40

The latitude of Thomasville, Georgia, is about 30°, while that of Stillwater, Oklahoma, is about 36°. A comparison is therefore difficult. The only official record so far available at Stillwater for comparison is that of a three year average on an eleven-year old Money Maker variety. This variety has averaged 9 lbs. of good sized, well filled nuts for three years.

4. Proceeding of National Pecan Growers' Association, 1924.

MANAGEMENT OF NATIVE PECAN GROVES

Value of Thinned Native Groves

The Bureau of Census has given Oklahoma credit for having approximately 500,000 nut trees. It is probable that there are many more native pecan trees in Oklahoma than the number indicates. Investigation in average native groves has shown that the number of pecan trees per acre varies from thirty to one hundred and twenty with an approximate average of one hundred trees. These groves of bearing trees may be turned into a valuable source of revenue to the Oklahoma farmers through proper management. The advent and rapid development of power cracking machines and the increasing consumption of shelled pecans has placed a value on native Oklahoma pecans that ranges from a few dollars per acre for thick uncared for native groves to as high as two hundred dollars per acre in a good year from native groves which have been thinned out to ten trees per acre and have been cultivated.

The increase in yield of thinned groves over native groves has been variously estimated from two to ten times as many pecans. Just exactly what this increase amounts to has not been definitely determined. The loss of pecans due to weeds and underbrush is eliminated by cultivation and the increased sunlight available to the ten remaining trees causes them to spread rapidly and to yield heavily. The yield of native pecan trees is quite variable but those who have practiced the thinning out and cultivation system of management report that yields are not only larger but are more regular. A summation of the experience of owners of native groves near Stillwater indicates that a native pecan tree from thirty to forty years of age if given room will very rarely yield less than ten pounds of pecans and in a good year such trees have been found to yield fifty to one hundred and fifty pounds per tree. Occasionally a native tree is found that yields three hundred pounds or more. One tree near Stillwater, Oklahoma, yielded three hundred and twenty pounds of pecans which wholesaled at 15 cents per pound in the season of 1925 and this tree is reported to have been a consistent bearer for a period of seven years.

The value of a native pecan grove in Oklahoma so far as its product is concerned, is practically the same regardless of its distance from markets or transportation facilities. This is because the pecan is not a highly perishable

product. From two to three hundred dollars worth of pecans may be loaded in an ordinary farm wagon and hauled over rough roads for any necessary distance without depreciation.

Selecting the Trees

The first step in the improvement of a native grove is to mark the trees which are to be kept. This should be done at harvest time in order that a sample of the nut which the trees produce may be obtained. Trees should be selected at from 60 to 70 feet apart. This distance may be averaged to some extent in order that there will be from ten to twelve trees to the acre. The selection should be based on the size of the tree, its form, and the size of the nut which it produces. If a tree is small or poorly formed and produces a small nut it should be marked for top working, provided a more desirable tree is not near at hand to take its place.

Marking the Trees

As each tree is selected it should be conspicuously marked and numbered. An excellent method is to paint a white band around the tree. This band will be easily seen from every direction and will assist not only in the selection of trees, but in the protection of the selected trees when the other trees of the grove are being removed. Numbering each tree is highly desirable. It is systematic and permits the taking of notes at the time of selection which may be used in future improvement.

Thinning the Grove

The best method of thinning is to kill each of the undesirable trees by girdling during early spring and then grub out the dead trees the following winter. The trees may be sawed off at the surface of the ground but this practice leaves a stumpy grove which can only be cultivated to advantage with a disc harrow.

Cultivating the Grove

If the contour of the land permits cultivation should be practiced. The newly thinned grove may be planted to row crops for a few years until the trees have spread. Some of the improved groves have been planted to alfalfa and have produced good returns of hay. The last cutting of alfalfa leaves the ground clear for pecan gathering. After the trees have spread, however, it will be necessary to practice clean culture through the summer for best results.

Top Working Pecans

Native pecan trees may be successfully top worked to improve varieties by one of several methods. The after care of the top worked pecan grove is far more important than the actual method of top working used. The trees are apt to give more attention to their own native sprouts than to the buds or grafts. These native sprouts must be rubbed off as they appear after the buds are set. The result of neglect of a top worked tree is shown in Fig. 8.

Stump Sprout Method

Many pecan trees which have been cut down in clearing land have sent up vigorous sprouts which may be top worked by chip budding, spring patch budding, or summer patch budding. If the sprouts have gotten quite large they may be cut back to where the trunk or limbs are about two inches or

less in diameter, and bark grafted as soon as the bark slips in the spring. If the graft fails to "take" the sprouts from the stubs may be patch budded in August. If these buds fail to "take" they may be chip budded or patch budded the following spring.

The use of these successive seasonal types of budding and grafting is very desirable. It is often difficult to get more than fifty percent of the grafts or buds to "take." By the use of "follow up" methods a successful bud or graft may be secured in practically every position desired.

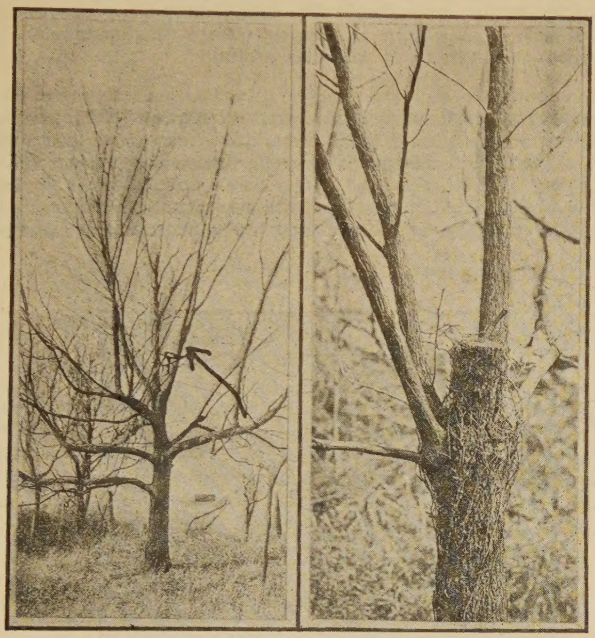


Fig. 8. The Result of Neglect of Top Worked Trees. The arrow points to one budded limb which has competed for ten years with many native limbs.

Cutting down large trees for the purpose of securing stump sprouts for budding has been recommended from several sources. This method has not been thoroughly tested. It is known, however, that a vigorous, fast growing tree may be produced in this manner.

Stub Trunk Method

Native trees up to ten inches in diameter may be cut to a stump which may be worked either from the ground or from a ladder. If there are limbs below the point where the stub is cut they may be cut off in such a manner as to form a cone or they may be removed entirely. This stub trunk will send out many shoots which by August will usually be ready to patch bud. If any of these buds fail the other methods mentioned may be used to follow up the work and insure a successful bud.

The chief objection to this method is that the large wounds which are necessarily made in cutting back the tree are difficult to heal. This may be

remedied by making smooth saw cut then cutting out a disc of galvanized iron to fit each wound. Paint the wound well with white lead, nail the galvanized iron cap over the wound and then paint over the cap.

Full Leader Method

This method is designed to utilize the entire trunk of the tree which in many instances has taken thirty years or more to grow. The method has been recommended from several sources, but detailed investigation of its merits seem to have not been made by those who have recommended its use. The Oklahoma Experiment Station is giving this method a thorough test. The present indications are that the method is a good one.

The method can only be used on the central leader type of tree. This type of tree, however, predominates in most of the native groves of Oklahoma. The limbs are cut back to short stubs from one to two feet long. Large 60d spikes are driven in the tree in the intervals between the stubs to enable the operator to climb the pole. The tree then produces sprouts about twenty of which are selected in a spiral manner around the tree and budded with the patch bud in August. The "follow up" methods are used here also.

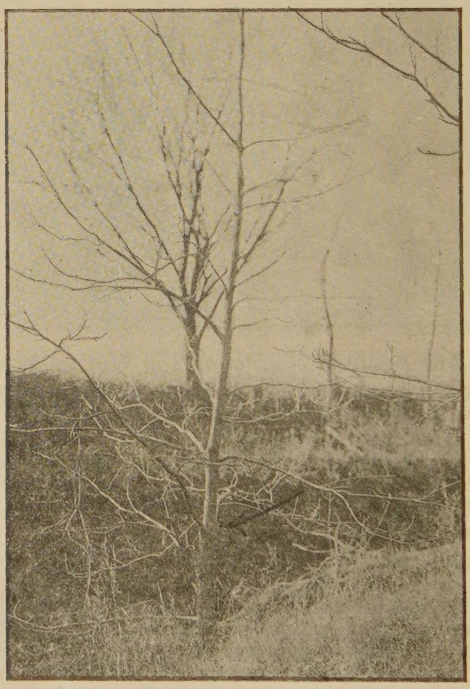


Fig. 9. A Good Job of Top Working a Small Tree.

The arrow indicates the point of union.

Cost of Top Working

The cost of top working will vary greatly with the method used. The stump sprout method where the sprouts are already formed is the least expensive. There should not be more than seventeen trees to the acre. Allowing thirty buds to insure a stand the cost is estimated to be as follows:

30 buds	$1.00
Labor preparing trees	1.00
Budding cost	5.00
After care for three years	10.00
Total cost	$17.00

The stub trunk method is more expensive. Its cost will vary with the size of the stubs used. For convenient sized trees topped at four feet from the ground the cost will not be very much greater than the cost of the stump sprout method.

The central leader method is the most expensive. The cost of top working 30 year old trees has been estimated to be as follows:

Cutting back 12 trees per acre	12.00
Removing excess sprouts	6.00
Budding 20 buds per tree	12.00
Forcing buds	6.00
Buds 250	7.50
Total per acre	$43.50

Where the work is done by the owner the actual cash expenditure is small. Where the top working is contracted the turning over of a successfully topped tree at the end of three years time is worth from one dollar to as much as ten dollars per tree, depending upon the size of the tree.